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Mazza

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[54] **DEVICE FOR THE AUTOMATIC BALANCING OF WASHING AND DRYING MACHINES**

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[51] **Int. Cl.** **B01d 33/40**

[58] **Field of Search** 210/144, 363, 365

[56] **References Cited**

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[57] **ABSTRACT**

A device for rebalancing the rotary baskets of washing machines and the like, of the kind in which liquid masses are used for balancing the basket. The rear wall of the basket is elastically deformed (for example, it is a metal disc) and the deformations are transferred to a valve which feeds with liquid a number of peripheral chambers mounted on the basket.

As rebalancing is achieved, the deformation of the disc ceases and the valve is closed. Water is spontaneously discharged in the usual suds tub.

5 Claims, 4 Drawing Figures

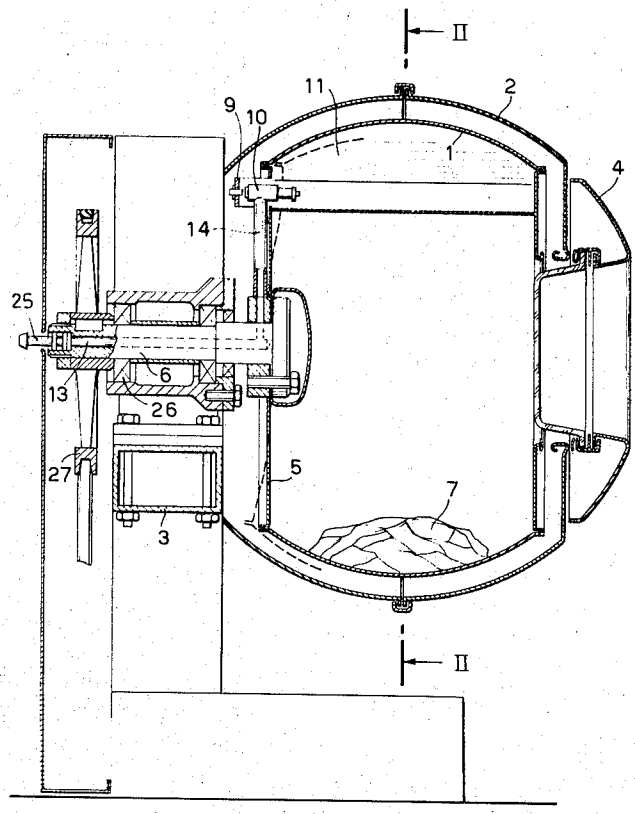


Fig. 1

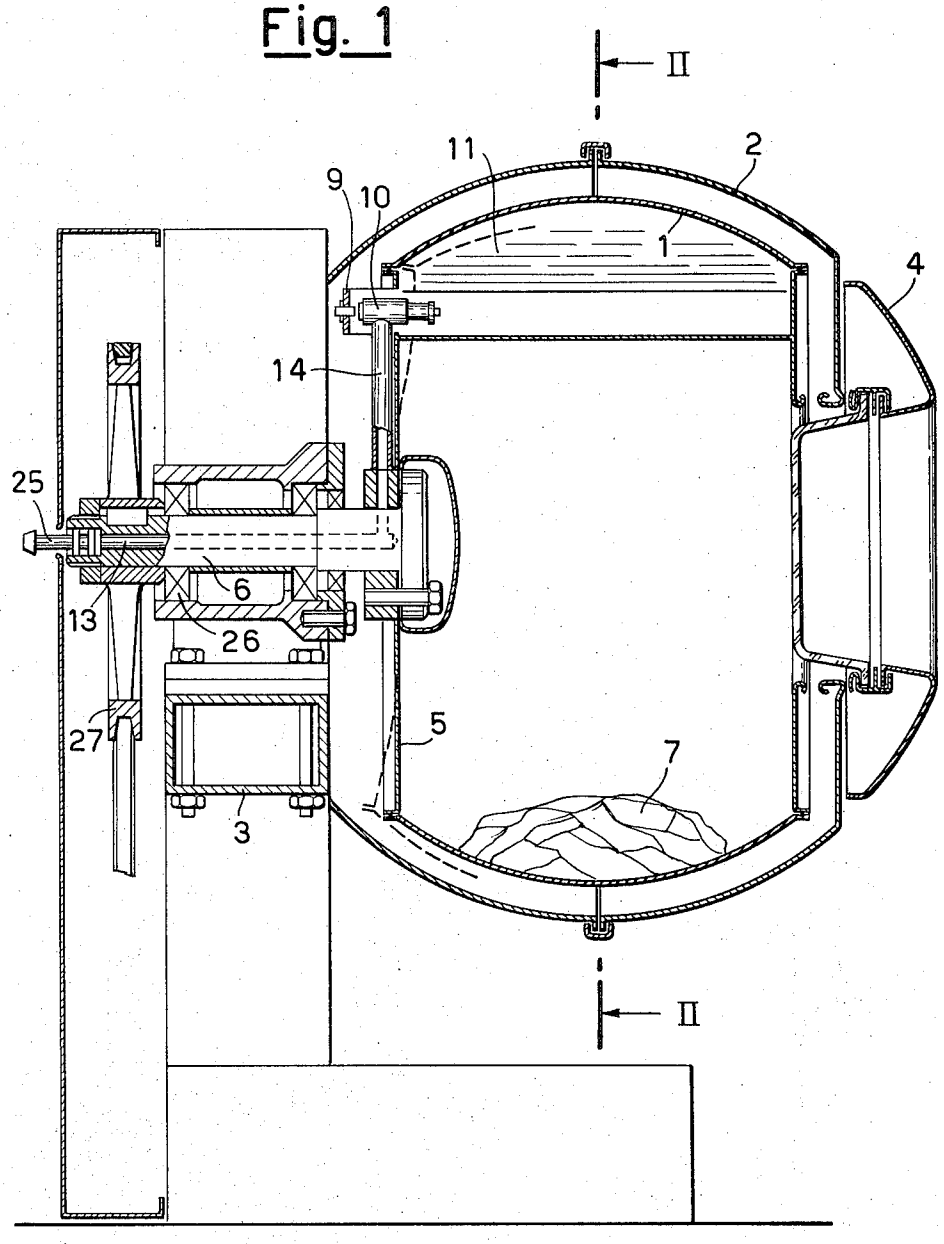


Fig. 2

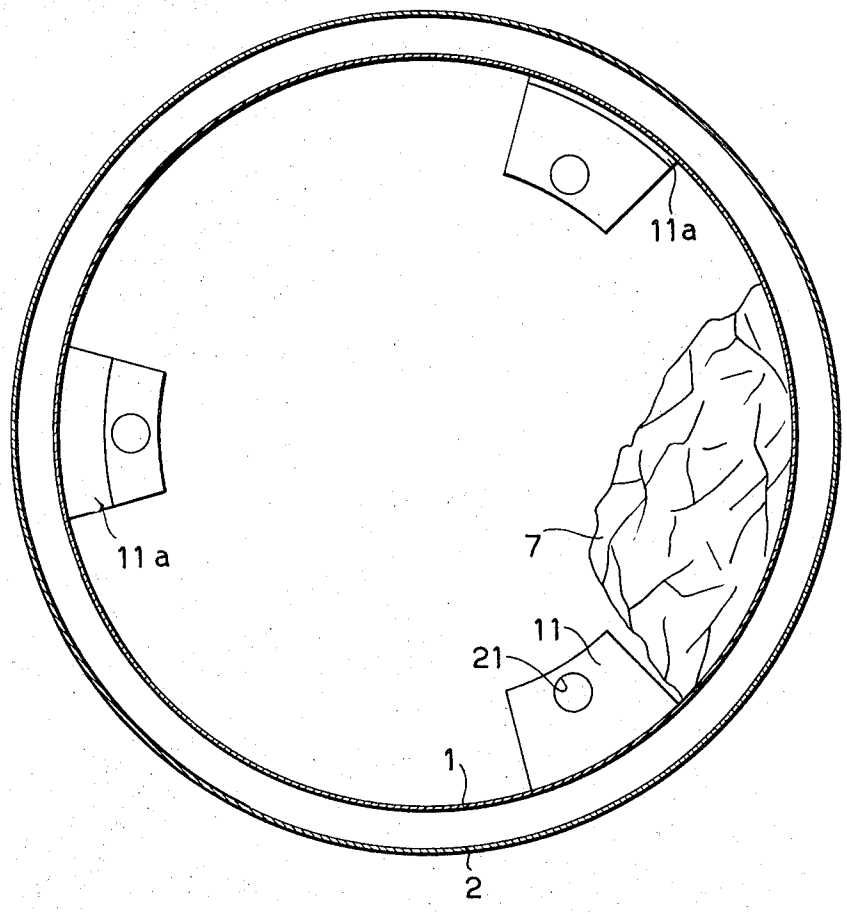


Fig. 3

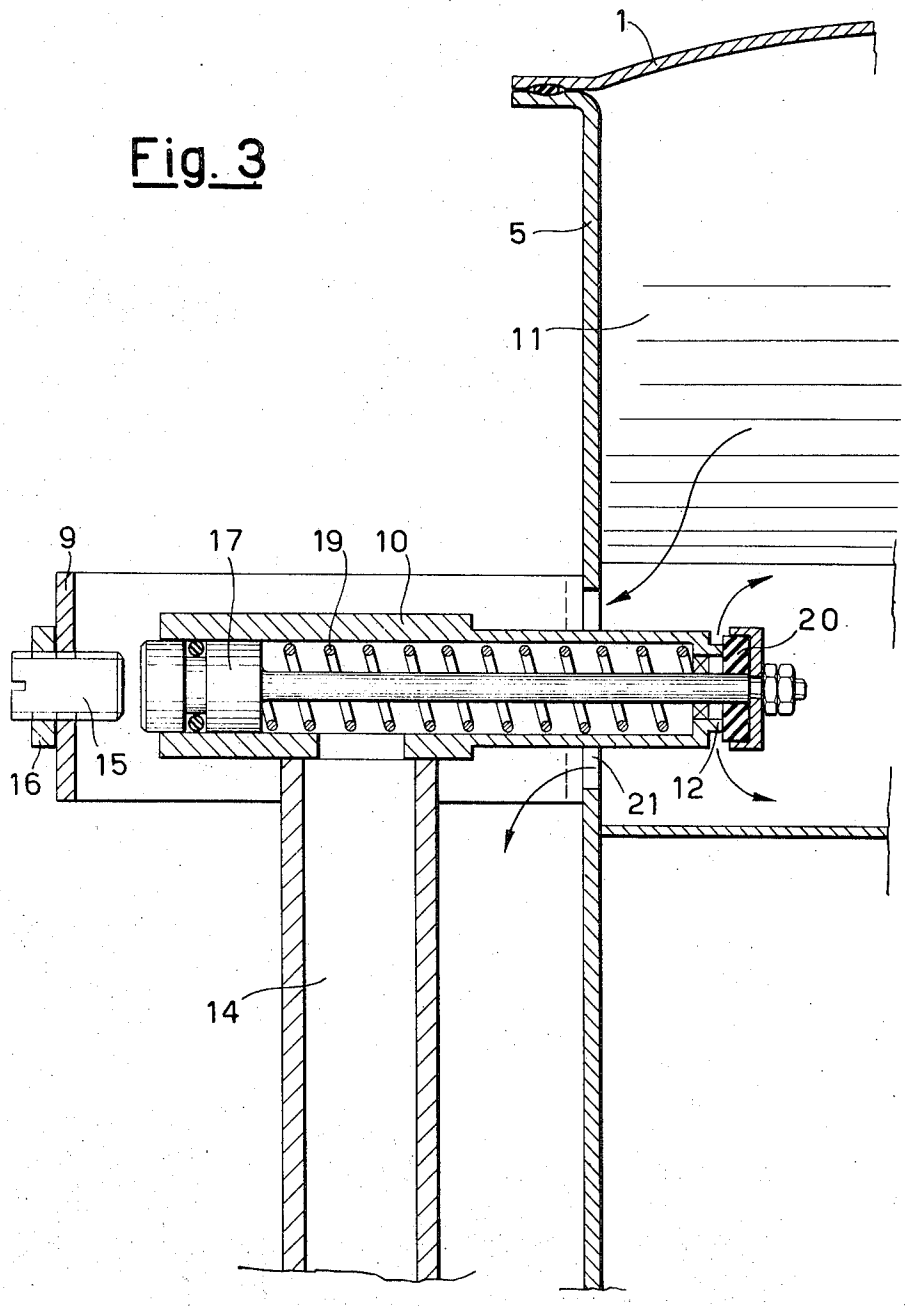
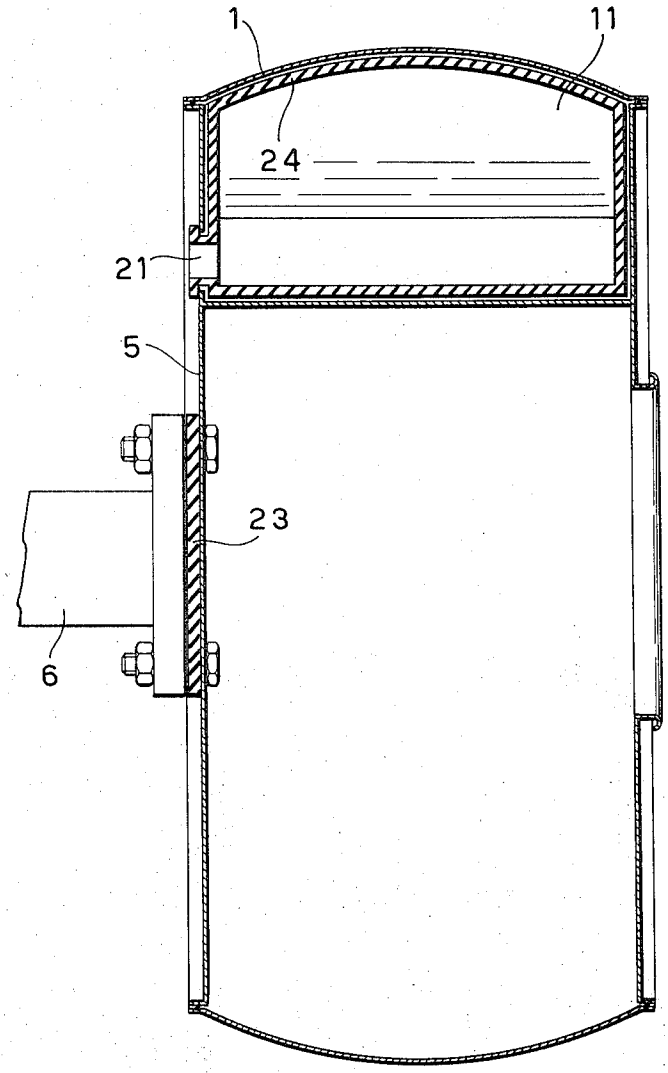


Fig. 4



DEVICE FOR THE AUTOMATIC BALANCING OF WASHING AND DRYING MACHINES

BACKGROUND OF THE INVENTION

This invention consists of a device, which is adapted to balance automatically the rotors of washing, centrifuging machines and the like.

In washing and drying machines, the rotary mass is never exactly centered relatively to the axis of rotation. It suffices to consider the linen which is loaded into the rotating drum of a washing machine or to vegetables loaded in a centrifuging machine for removing water. The loads of linen, vegetables and other materials cannot be introduced by an operator in such a way as to achieve a satisfactory static and dynamic balancing of the rotor.

In addition, the irregular shape of the loaded articles, and the relative motion obtaining between the drum and the load, would destroy after a few instants of time a hypothetical rotor balancing as obtained when the machine is loaded.

Considerable unbalances thus exist and, in any case, both static and dynamic, which originate a radial force which rotates about the axis of rotation, and a torque lying on a plane passing through the axis of rotation and which rotates therewith, respectively.

Said rotary force and torque give rise to oscillations or vibrations, which originate serious problems as to the practicability of embodying structures adapted to withstand them.

Such problems are generally solved in one of the following manners:

a. By providing a drum, a shaft and bearings and an overall structure which are so robust as to withstand, without appreciable deformation (an almost rigid system) to the stresses originated by the rotor unbalance. In addition, the machine should be sturdily anchored to the floor to prevent jerks and displacements of the machine.

Lastly, the slab or the floor should have a specially provided concrete bedplate, or a bedplate of another material, which does not impair the safety of the building in which the machine should operate.

This method, for example, is used for many industrial laundry washers and the shortcomings are apparent, such as a high first cost of the structure and all the component parts of the machine, a high cost for the installation of the machine, vibrations and noise transferred to the spaces adjacent to that where the machine is operative.

b. Supporting the rotor and the motor, or the whole supporting structure therefor, with an elastic and dampening system, that is, with springs and shock-absorbers.

In such a case, the drawback is the cost of the resilient suspension for dampening, and the supporting structure for them.

c. Balancing the rotor by feeding the interior of the same with a mass, generally a fluid, in such a position as to restore the system balance. In such a case a rotor-unbalance responsive device should be available, which is capable of evaluating the magnitude of the unbalance and of identifying the rotor position where the unbalance exists. A correction device should moreover be available, which is adapted to forward, upon the consentment of the responsive portion, the balancing masses to the most appropriate positions. Such a system has the defect of being costly and has been suggested by prior inventors, such as George N. Starr and Nor-vin L. Pellerin, in the U.S. Pat. No. 3,117,926.

OBJECTS AND SUMMARY OF THE INVENTION

The object is to suppress the oscillations due to rotor unbalance when the latter is rotated at a high speed.

The device according to the present invention is of the kind comprising a rotary basket as mounted in a cantilever fashion on its driving shaft and having peripheral chambers adapted to house a liquid for balancing the abnormal stresses, and more particularly those due to irregular distribution of the linen in the interior of the basket which is rotated at a high speed, said device being characterized in that it comprises a portion of the basket which is elastically deformable under the action of an unbalance of the basket, and is adapted to actuate, by its deformations, mechanical means to feed said liquid to one or more of said chambers, with said mechanical means being rotatable integrally with the shaft and the basket attached thereto.

According to a preferred embodiment, the elastically deformable portion of the basket is the back wall of the basket, perpendicular to the rotation shaft, or, as an alternative, a portion of said wall, such as a disc of a deformable material which supports the basket.

Each chamber is fed, according to the invention, through an inlet valve for each peripheral chamber, whose valve body is integral with the rotary shaft for the basket, while the stem of the movable head of the valve is driven by a member (such as a simple strap) affixed to the deformable wall of the basket with, the outlet port of each chamber being formed in the area nearest to the axis of rotation, in direct communication with the tub which is external of the rotating basket.

The operative and structural features of the device will become clearer by having reference to one of the possible embodiments as shown in the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows an axial cross-sectional view of a laundry washing machine according to the invention, with centrifuge.

FIG. 2 is a cross-sectional view taken along the line II—II of FIG. 1.

FIG. 3 is a cross-sectional close up view of the feeding valve and the discharge outlets for an individual balancing chamber, and

FIG. 4 shows a cross-sectional detail view of one of the chambers affixed to the drum and associated with a rubber cavity which mates the inner walls of the chamber.

DETAILED DESCRIPTION OF THE INVENTION

The device as shown herein essentially comprises a foraminous rotary basket **1**, a fixed external tub **2**, a front door **4** defined by a hinged door which closes the tub at the front, and a supporting structure **3**.

The rear wall of the basket **1** is an elastically deformable metal disc **5**, mounted in an overhanging manner on a rigid shaft **6**, which is rotated in appropriate bearings **26** and driven by a drive-transfer member such as a sheave or pulley **27**. The basket has three or more peripheral chambers or reservoirs, **11**, evenly angularly

spaced apart along the periphery of the basket (FIG. 2).

In the neighborhood of the wall of each reservoir **11**, which confronts the axis of rotation of the basket, a port **21** (FIG. 3) opens, through which the head portion of a tubular body **10** of an inlet valve is passed, with the inlet valve formed by an outlet mouth **12** being closed by a movable plug or head **20** mounted on a stem **17** which emerges in a sealtight manner from the rear base of the body **10** and which, by means of a return spring **19**, tends to keep the inlet valve normally closed. The tubular body **10** is integrally connected to, and in communication with, a stiff or rigid radial duct **14** which, in turn, communicates with an axial duct **13** to allow the water under pressure coming from the water main through a fixed fitting **25** which is sealtight when rotated, to feed the reservoir **11**.

In front of the head of the stem **17** there is a plate **9** which is affixed to the deformable disc **5**. The plate has an adjustment screw **15** with its attendant locking nut **16**.

According to an improved embodiment (see FIG. 4) a rubber container **24** is inserted in each of the individual reservoirs **11** and is adapted perfectly to match, with its walls, the inner walls of the reservoir. This approach allows a considerable cost reduction to be achieved, in that it dispenses with time-consuming operations for a sealtight welding on the stainless steel of the basket and permits a simpler connection of the reservoir to the basket, and of the tubular valve body to the reservoir.

Likewise, the resilient disc **5** can be replaced, for the ends of balancing, by an annular rubber disc **23** (FIG. 4) which, by being deformed, enables the plate **9** to drive the stem **17** of the inlet valve.

Lastly, it should be noticed that the water of the reservoir **11** can be directly dumped into the tub through the hole **21** which is not entirely closed by the tubular body **10** of the inlet valve.

During centrifuging, if the irregular distribution of the linen **7** produces a torque which deforms the disc **5**, the plate **9** and its screw **15** press the stem **17** and thus open the inlet valve, so that water enters the reservoir **11** concerned until the incoming water mass produces, during its rotation, a torque which is equal and opposite to the unbalancing torque, so that the system becomes balanced and undesirable vibrations are put down thereby.

In FIG. **2**, in which the water held in the reservoirs **11** is indicated at **11***a*, the equilibrium condition is diagrammatically depicted in the most general case where two reservoirs **11** are subjected to the water feed to different degrees, in order to effect balancing.

Once balancing has been achieved, inasmuch as the deformation of the disc **5** is discontinued, the plate **9** is set back and allows the return spring **19** to close the valves **12-20**.

On completion of centrifuging and during the attendant basket slow down, the water held in the reservoir is permitted freely to flow into the machine tub through the ports **21**.

What is claimed is:

1. A device for the automatic balancing of washing and centrifuging machines of the type including a horizontal driving shaft, a rotary basket, said basket having an elastically deformable vertical rear wall, said rear wall being mounted on the driving shaft whereby the basket is carried in a cantilever manner on the driving shaft, and means within the basket defining peripheral chambers for receiving an amount of liquid for balancing the unbalancing stresses due to an irregular distribution of the basket load, improvement comprising valve means for feeding liquid to at least one of the chambers, means operably mounting the valve means on the shaft and basket for rotation in unison therewith, a plate affixed to the deformable rear wall of the basket adjacent the valve means, and a valve actuating member carried by the plate and operated by the deformation of said rear wall for actuating the valve means to feed liquid to said at least one chamber.

2. A device for the automatic balancing of washing and centrifuging machines of the type including a driving shaft, a rotary basket mounted in an overhanging manner on the driving shaft, and means within the basket defining peripheral chambers for receiving an amount of liquid for balancing the unbalancing stresses due to an irregular distribution of the basket load, the improvement comprising valve means for feeding liquid to at least one of the chambers, means operably mounting the valve means on the shaft and basket for rotation in unison therewith, said basket having a portion thereof which is elastically deformable under the action of an unbalance of the rotary basket, and means directly operated by the deformation of such portion for actuating the valve means to feed liquid to said at least one chamber, in which there is a valve means for each chamber, each valve having a hollowed body integral with the driving shaft, said body having an outlet, a head for closing the outlet, an actuating stem secured to the valve head extending axially of the hollow body, and an operating member affixed to said elastically deformable portion operative upon deformation of said portion to actuate the stem to move the head to open the outlet, an outer tub in which the basket is located and each chamber having an outlet in direct and continuous communication with the outer tub, with the outlet of each valve extending through the outlet of each chamber into the interior thereof.

3. The device as claimed in claim **2** in which a duct located externally of the basket is affixed to the driving shaft and valve body, the driving shaft having an axial bore for feeding liquid, said axial bore being in communication with the interior of the duct to allow flow of the feeding liquid into the chamber when the head opens the valve body outlet, and spring means within the valve body normally biasing the head to close the valve body outlet.

4. The device as claimed in claim **2** including a rubber container inserted in said chamber as snugly mating the means defining the chamber.

5. The device as claimed in claim **2**, in which said operating member includes a plate affixed to said elastically deformable portion in front of said actuating stem secured to the valve head, and a screw carried by said plate for actuating said stem.

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